

**Remarks**

Claims 13, 23 and 24 have been amended; claims 15 and 16 have been cancelled; and new claims 27 and 28 have been added. Claims 4, 6 and 7 were previously cancelled. Accordingly, claims 1-3, 5, 8-14 and 17-28 are currently pending.

**I. Amendments:**

Claim 13 was amended to recite that the dispersion comprises a condensated naphthalene sulfonate anionic stabilizer and the cationic organic compound is a surfactant selected from the group consisting compounds having the general formula  $R_4N^+ X^-$ , where each R group, independently of each other, is hydrogen or a hydrocarbon groups having from 1 to 30 carbon atoms, and X is an anion. Support can be found in previously presented claims 15 and 24. No new matter has been added.

Claim 23 was amended to depend from claim 14 and claim 24 was amended to be consistent with amended claim 13. Again, no new matter has been added.

New claim 27 depends from claim 14 and recites that the emulsifier is present in an amount from 0.01 to 5 wt% based on the dispersion. Support can be found in the specification at page 3, lines 32-34. No new matter has been added.

New claim 28 depends from claim 27 and recites that the surfactant is present in an amount from 0.1 to 0.55 wt% and the anionic stabilizer is present in an amount from 0.185 to 3 wt%, based on the dispersion. Support can be found in the specification at page 4, lines 18-20; page 5, lines 34-35; and Example 4. No new matter has been added.

**II. The Invention:**

The present invention relates to an aqueous dispersion useful for internal or surface sizing, as well as preparation and use thereof in the production of paper. The aqueous dispersion includes at least one cellulose reactive sizing agent selected from the group consisting of ketene dimers and multimers, at least one cellulose non-reactive sizing agent (claim 20) and specifically such a sizing agent selected from the group consisting of copolymers of styrene or substituted styrene with at least one other kind of ethylenically unsaturated monomer (claims 1, 5, 8, 17 and 19), and at least one emulsifier selected from the group consisting of oxyalkylene phosphate esters and salts thereof. In other embodiments the dispersion also includes at least one cationic organic compound having a weight average molecular weight less than about 10000 and a condensated naphthalene sulfonate anionic stabilizer and a cationic organic compound that is a surfactant selected from the group consisting compounds having the general formula  $R_4N^+ X^-$  (claim 13).

It has been found that effective internal and surface sizing can be achieved by using a dispersion comprising both a ketene dimer or multimer and a cellulose non-reactive sizing agent, and that high stability of such dispersions can be obtained by including a special kind of emulsifier, namely, an oxyalkylene phosphate ester or a salt thereof.

Examples 1 and 2 of the present application show that the present sizing dispersion gives considerably improved sizing efficiency than conventional internal or surface sizes. Examples 3 and 4 further show that the present sizing dispersion has improved stability and particle size distribution, due to the presence of the emulsifier, as claimed.

### **III. Rejections:**

Claims 1-3, 5, 8, 9, 12-15, 17-22 and 26 stand rejected, under 35 U.S.C. §103(a), as being unpatentable over Cenesio et al (US 6,162,328), in view of Dilts et al (US 6,576,049) and further in view of Wendel et al (US 4,051,093). The Applicant respectfully traverses.

Cenesio et al disclose an aqueous surface sizing composition comprising at least one cellulose reactive size that is not solid at 25°C and at least one cellulose non-reactive size. However, Applicants respectfully submits that he is unaware of any disclosure by Cenesio et al of any emulsifier at all being present. It is respectfully submitted that although it is mentioned that sizes generally are used as emulsions or dispersions, this does not suggest or teach that any special emulsifier should be used in addition to the active components. In fact, Cenesio et al teach that the active sizing agents are formed into a dispersion of a starch solution, which also is supported by the Examples in which no emulsifier is added.

Dilts et al disclose a sizing composition comprising ASA, AKD or rosin, an emulsion stabilizer and a hydrophobic substance and optionally a surfactant. Applicant respectfully submits that although ethoxylated phosphate esters are mentioned as a possible surfactant, this is only one of a vast number of different kinds of surfactants recited and there is no suggestion that such a surfactant is particularly suitable for emulsifying ketene dimers or multimers.

Wendel et al disclose a copolymer emulsion which may be used as a sizing agent for paper (column 6, lines 13-14; claim 1). Wendel et al teach that the emulsion does not need an emulsifier, but do disclose a number of conventional cationic, anionic, amphoteric and non-ionic emulsifiers (column 5, lines 2-24) that can be optionally included. If nevertheless present, Wendel et al teach that cationic emulsifiers are preferred. Although alkyl phosphates are mentioned, this is only one of a vast number of different kinds of surfactants recited. Further, there is not the slightest indication that any of the emulsifiers mentioned could be used for a

dispersion comprising ketene dimers or multimers. Moreover, Applicant is unaware of any disclosure, teaching or suggestion by Wendel et al of a combination of a cellulose reactive sizing agent selected from ketene dimers or multimers and a cellulose non-reactive sizing agent, as presently claimed.

The Office Action contends that it would have been obvious to use the claimed styrene co-polymers as the non-cellulose reactive sizing agent in the composition and method of Cenesio et al in view of Dilts et al and further in view of Wendel et al. Applicant respectfully disagrees.

Cenesio et al teach (at col.8, lines1-17) that the sizes can be mixed and that a good stability is obtained. This is confirmed in example 8. Applicant respectfully submits that since Cenesio et al do not anywhere suggest use of a surfactant, one of ordinary skill in the art would consider such surfactants not to be necessary. Further, it is submitted that since mixing operation cost money, (raw material, time, reactor usage) the skilled person would be discouraged by Cenesio et al to use a surfactant.

Dilts et al teach use of a combination of at least one sizing agent in combination with a stabilizer and a hydrophobic substance. In col. 14, line 46 to col. 15, line 59, it is said that such sizing emulsions MAY CONTAIN (col. 14, line 46-47) a further surfactant. Applicants submits that this reference merely gives a fleeting indication for using a surfactant in paper sizing systems comprising a sizing agent in combination with a stabilizer and a hydrophobic substance. There is no indication whatsoever for any benefit of using a very specific subset of surfactants (as in the present claims) in combination with a mixture of sizes.

It is respectfully submitted that there is no reason or benefit suggested by Dilts et al to use the specific compounds (as presently claimed) in the products of Cenesio et al to create a more complex system, compared to the more simple system which Cenesio et al teaches works well. Further, as Cenesio et al teach away from using a surfactant (as discussed above), it is submitted that the skilled person would have no reason to make the combination and arbitrarily make a more complex system.

Even assuming arguendo that the combination was made, it is submitted that the skilled person would merely use the combination of Cenesio et al with the stabilizer and hydrophobic substance of Dilts et al , which is not in accordance with the presently claimed invention. Further, even after making such a combination, it is submitted that the skilled person would have to remove the stabilizer and hydrophobic substance and substitute a specific surfactant (i.e. the

oxyalkylene phosphate ester) for them. Applicants respectfully submit that the skilled person would have no reason to do so on the basis of the disclosures by Cenesio et al and Dilts et al.

The Wendel et al reference relates to shear-resistant polymer emulsions by selecting appropriate monomers when making the polymer. In col. 4, line 63 – col. 5, line 24, it is stated that due to the selection of monomers C and D, no surfactant is needed. However, Wendell et al disclose that a surfactant CAN BE present (col. 5, line 4), but without any discussion of a specific benefit for including a surfactant, let alone the specific surfactant as presently claimed. It is again submitted that because of the costs and more complex system, and because Wendell et al teach that surfactants are not needed, one of ordinary skill in the art would have no reason to include surfactants in the system of Cenesio et al. However, even assuming argendo that one of ordinary skill in the art would arbitrarily add a surfactant to the Cenesio et al system, there is no reason to make a specific selection for alkoxylated phosphate esters. On the contrary, when combining Cenesio et al and Wendel et al, the skilled person would at best arrive at a formulation wherein the special polymer of Wendel et al is included as one of the sizing agents (if active as a sizing agent at all). It is submitted that such a combination would not arrive at the presently claimed invention.

Considering the cited references as a whole one of ordinary skill in the art would understand that: 1) Cenesio et al do not disclose using any emulsifier at all; 2) Wendel et al prefer using no emulsifier and if an emulsifier is to be used, a cationic emulsifier is preferred; 3) Dilts et al disclose a great number of surfactants but do not point out anyone as being suitable for polymers; and 4) based on the teaching of Cenesio et al, one of ordinary skill in the art would merely appreciate that they could be used (as internal sizing agents) in addition to the surface sizing composition of Cenesio et al and not to pick and choose components (emulsifiers) of those compositions to arbitrarily add them the surface sizing composition of Cenesio et al (which does not use an emulsifier).

It is respectfully submitted that a person skilled in the art faced with the above information would have no incentive to pick an oxyalkylene phosphate ester or salt as an emulsifier in a composition comprising a ketene dimers or multimer and copolymers of styrene or substituted styrene with at least one other kind of ethylenically unsaturated monomer, as presently claimed. In contrast, it appears that the present invention can only be arrived at by means of hindsight consideration. Thus, without any reason from the prior art as a whole or from common general knowledge a selection of an oxyalkylene phosphate ester or salt as an emulsifier in such a composition cannot have been obvious to a person skilled in the art.

It is respectfully submitted that the cited references merely disclose the possibility of using any emulsifier selected from a broad range of different emulsifiers, as discussed above, without any suggestion to modify their teachings to arrive at the claimed invention. A "determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention." *Crown Operations*, 62 U.S.P.Q.2d at 1922 (*quoting ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546, 48 U.S.P.Q.2d 1321, 1329 (Fed. Cir. 1998)). There must be a teaching or suggestion in the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor. *Id.* at 1922. In *Grain Processing Corp. v. American Maize- Prods. Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988), the Federal Circuit warned that care must be taken to avoid hindsight reconstruction by using the present application as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claimed invention.

The Office Action cites *In re McLaughlin*, 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971), apparently for the proposition that as long as each element of the claims were in the prior art, a hindsight reconstruction is proper. Applicant respectfully submits that *In re McLaughlin* should not be read so broad and to the extent it can be interpreted to conflict with the above cited Federal Circuit cases, it has been effectively overruled by the Federal Circuit.

Regarding the instant case, Applicant submits that there is no reason based on the cited references to combine them in the manner presently claimed and the only reason one skilled in the art would arrive at the presently claimed invention is using the present application as a blueprint.

Applicant respectfully submits that, in order to obtain the dispersion as presently claimed, which includes using specific emulsifiers for the claimed dispersion (that includes both the specific cellulose reactive and cellulose no-reactive sizing agents), one would have to pick and choose individual aspects from the various teachings in the cited references and then select the specific claimed emulsifier, in the absence of any teachings or suggestions to do so. It is respectfully submitted that the only way to accomplish this, is with the improper use of hindsight.

Applicant respectfully submits that the cited references, when read as a whole do not, disclose, suggest or teach that it would be possible or desirable to select an emulsifier, as presently claimed, for stabilizing a dispersion that includes both a ketene dimer or multimer and a

styrene cellulose non-reactive sizing agent. Therefore, it is respectfully submitted that the presently claimed invention is not obvious in view of these cited references.

Accordingly, it is respectfully requested that the rejections of claims 1-3, 5, 8, 9, 12-15, 17-22 and 26 under 35 U.S.C. § 103(a), as being obvious over Cenesio et al, in view of Dilts et al and further in view of Wendel et al, be withdrawn.

Claims 10, 11, 16 and 23-25 stand rejected, under 35 U.S.C. §103(a), as being unpatentable over Cenisio et al, in view of Dilts et al, and further in view of Wendel et al, and even further in view of Frolich et al (US 6,306,255). The Applicant respectfully traverses.

First, it is respectfully submitted that since the above claims include all the features of the independent claims they are non-obvious for the same reasons as set out above.

Second, with regard to the claims that depend from claim 13, Applicant respectfully submits that Frölich et al do not provide any reason to include a condensated naphthalene sulfonate, as presently claimed.

Frölich et al disclose a sizing composition comprising a cellulose-reactive sizing agent and a hydrophobically modified dispersing agent, and optionally a non-cellulose reactive sizing agent. Applicant submits that he is unaware of any disclosure by Frölich et al of the presence of copolymers of styrene or substituted styrene or an emulsifier selected from the group consisting of oxyalkylene phosphate esters and salts thereof. This is acknowledged by the Office Action.

Although Frölich et al disclose a combination of a cellulose-reactive sizing agent and cellulose non-reactive sizing agent, Applicant respectfully submits that there is no teaching or suggestion that a dispersion of high stability could be obtained by selecting an emulsifier as presently claimed. It is further submitted that there is no guidance on how to select an emulsifier from among the thousands of emulsifiers known per se, including those mentioned in Wendel et al, in order to provide a stable dispersion, as claimed.

Thus, considering that the dispersion of Frölich et al is so fundamentally different from those of Cenesio et al and Wendel et al it is respectfully submitted that it cannot have been obvious to a person skilled in the art to include any condensated naphthalene or lignin sulfonate in a dispersion comprising comprising a ketene dimers or multimer, a copolymer of styrene or substituted styrene and an oxyalkylene phosphate ester or salt thereof. Accordingly, it is respectfully submitted that at least claims 23-25 cannot have been obvious to a person skilled in the art.

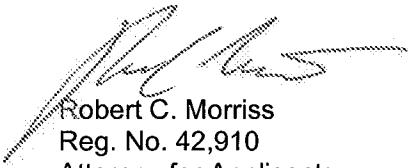
Accordingly, it is respectfully requested that the rejections of claims 10, 11, 16 and 23-25 under 35 U.S.C. § 103(a), as being obvious over Cenesio et al, in view of Dilts et al, and further in view of Wendel et al, and even further in view of Frolich et al, be withdrawn.

The Office Action indicates that the results (in the present examples) are not commensurate in scope with the broadly claimed subject matter. Applicant respectfully disagrees and submits that the unexpected results are commensurate in scope with the present claims and certainly with claims 27 and 28, which recite specific sizing agents, emulsifier, cationic organic compound, and anionic stabilizer, in specific amounts.

**IV. Conclusion:**

In light of the foregoing, Applicant respectfully submits that the application as amended, including claims 1-3, 5, 8-14 and 17-28, is now in proper form for allowance, which action is earnestly solicited. If the Examiner has any questions relating to this Amendment or to this application in general, it is respectfully requested that the Examiner contact Applicants' undersigned attorney at the telephone number provided below.

Respectfully submitted,



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